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Can Agriculture and Biodiversity Coexist?

Article by Adam Calo
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To free up land for biodiversity conservation while satisfying growing food demand, techno-optimist narratives suggest indefinitely increasing agricultural productivity, including through massive pesticide use. But this view, which has made its way from an academic niche into corporate and policy-making circles, overlooks the complexity of natural ecosystems and the market dynamics that regulate access to food.

The idea that increasing agricultural productivity will free up land for biodiversity and solve global hunger is gaining popularity in Europe and beyond. In *Our World in Data*, Hannah Ritchie argued that "If we can find ways to produce enough food on less cropland we can preserve more habitat for the world's wildlife." In December 2022, Dutch MP Nilüfer Gündoğan claimed that thanks to agricultural intensification, "in Europe alone, we could give 75 per cent of our agricultural surface back to nature, without this leading to cold winters, food shortages, economic scarcity."

Gündoğan's speech was inspired by British writer and environmental activist George Monbiot's book *Regenesis: Feeding the World Without Devouring the Planet* (2022). Monbiot was also interviewed in the documentary *Paved Paradise*, which advocates for high-yielding, biotechnology-aided agriculture, and garnered significant praise in the Netherlands. This techno-optimist vision is particularly popular in corporate circles. According to the agrochemical giant Syngenta, "Reducing the amount of arable land needed per unit of crop allows leaving existing untouched land in its natural state."

In the EU, agricultural policy is back on the agenda with the Nature Restoration Law and the Farm to Fork Strategy (both crucial parts of the European Green Deal), the renegotiation of the EU's Common Agricultural Policy by 2027, and a proposed 10-year extension of the use of glyphosate, which EU countries are going to vote on in early November after failing to reach an agreement. In this context, understanding the blind spots of techno-optimist approaches to agriculture and their influence on policymaking is all the more important.

Sharing or sparing

In academic debate, the idea that increased productivity favours the protection of biodiversity while combating hunger has its roots in the early 2000s, when a group of British conservation biologists tried to identify the optimal land use for both biodiversity and food production, and came up with the land sparing-land sharing framework.

According to the land sparing model, intensive food production in cultivated areas frees up more land for non-human species. Land sharing, on the contrary, is based on a more widespread, less intensive agricultural system which promotes biodiversity within the farmed areas. If biodiversity had a vote, the researchers claimed, it would choose land sparing.

Several disciplinary ecologists set out to verify the theory empirically, and reached a similar conclusion after conducting biodiversity surveys across different farming landscapes. The offspring of this land

sparing vision today embraces “sustainable intensification” in agriculture.

Many conservation biologists, however, contested that approach, asserting that biodiversity depends on complex interactions across different land use types. An insect, for example, does not respect artificial boundaries, and its ability to survive is therefore influenced by the biodiversity conditions of both farmed and unfarmed land. Matters are made worse for biodiversity when farmed areas are characterised by monocultures with high pesticide and herbicide use, as is often the case in the land sparing model. In such contexts, local extinctions are more likely to become permanent. A virtuous model would therefore privilege the ecological quality of farmed landscapes over maximising productivity, while also combating the drivers of deforestation.

Others went further, rejecting the core assumptions of the land sparing-land sharing framework. First, the idea that wild areas that exclude people are good for either agricultural livelihoods or biodiversity is misguided. Second, seeing global hunger as a matter of production is based on the tacit assumption that food demand is fixed. In other words, the land sparing-land sharing controversy overlooks the political dimension of how and why food is produced, as well as who has access to it.

A virtuous example?

Advocates of land sparing refer to Costa Rica as an example to follow. Over the last decades, the country has managed to stop and then reverse deforestation trends, while also investing in intensive tropical fruit production. Indeed, there are important lessons to be drawn from Costa Rica’s use of grants and loans to farmers to incentivise reforestation. However, the country’s agricultural policy is notorious for the social and environmental harms stemming from export-oriented intensification.

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High-yielding monocultures demand increasing use of pesticides to maintain productivity over time. A recent UNDP report found that the average use of pesticides in agriculture between 2012 and 2020 was 34.45 kilos per hectare in Costa Rica, by far the highest compared to other OECD countries like Mexico, Chile, the US, Canada, Colombia, and Panama. The combined consequences of ailments, disabilities, and lost productivity associated with the high consumption of pesticides cost Costa Rica 9 million dollars annually.

In addition to the health of agricultural workers and consumers, intensification also harms biodiversity. A long-term study found that while protected areas had increased over time in Costa Rica, their coexistence with pesticide-intensive banana and pineapple plantations led to poor connectivity and habitat quality. Bird, plant, and insect diversity is decreasing as a result.

A similar trend can be observed in Europe. Scientists have tracked a 75 per cent drop in the biomass of flying insects in European protected areas over a 30-year period. This has been attributed to the poor habitat quality and toxic environments of farmed land. The number of bird-eating insects is also shrinking, as the overall quality of farmed landscapes, protected areas, and their interaction is

undermined by agricultural intensification.

Chasing profit

Perhaps the core issue with land sparing is that it assumes a direct link between productivity and conservation. While land clearing for agriculture or grazing needs to be addressed in the fight against climate change and biodiversity loss, there is no guarantee that increasing agricultural yields will lead to conservation elsewhere.

Empirical evidence suggests that the opposite is often true. One long-term study focusing on 122 nations along the tropics found a strong association between increasing commodity production for export and forest area loss.

Market dynamics, as it turns out, are key drivers of land exploitation. Increased efficiency creates a window for greater profits, and a logical way to seize that opportunity is to bring more land into production. Competition among farmers encourages the adoption of efficiency tools, further incentivising greater production through expansion. In a world of competition, efficiency gains are quickly eroded, putting farmers on a treadmill of production, where the next move is to degrade more land for the same profits, or to seek another efficiency package.

The promise of reversing biodiversity loss lies in landscapes with people who use land sustainably, rather than in fortress-like conservation areas.

To avoid this race to the bottom, some advocates of land sparing suggest combining agricultural intensification with habitat preservation programmes. However, this doesn't make up for the negative consequences of intensification and high pesticide use on biodiversity and human wellbeing. Runoff from degraded, nutrient-laden soils flows into streams, degrading water quality and the livelihoods of downstream fisheries, for example.

Moreover, the inclusion of place-based ecological knowledge is crucial to maintaining high levels of biodiversity in protected areas and resisting the market and political forces that threaten degradation. The promise of reversing biodiversity loss lies in landscapes with people who use land sustainably, rather than in fortress-like conservation areas.

From exploitation to sustainability

Market forces, as well as agricultural, forest, and trade policies, drive pressure on natural habitats far more than productivity dynamics. Some countries or regions may have stronger enforcement of environmental protection, price speculation may incentivise one crop over another, seed market fluctuations may influence farmers' choices, and so on. These political and market dynamics determine when, if, by whom, and how prime habitats are cleared for agriculture.

Global hunger is driven by inequality, injustice, and capitalistic power structures. It is not primarily a problem of insufficient yields. Intensification may have positive, negative or no effect on food access and security, while it often conceals negative impacts on biodiversity. To be truly sustainable, intensification methods (such as climate-smart agriculture, vertical farming, genetically modified crops, and alternative proteins) need to address species richness within their boundaries of practice and in relation to their

landscapes – not in an undefined “elsewhere”.

In practice, the popularity of the land sparing model has brought huge benefits to the agribusiness industry. In the past, the environmental degradation of intensively farmed areas was mostly presented as a necessary evil to feed the world and ensure rural wellbeing. As land sparing narratives have taken hold, including within the environmental movement, intensification and sustainability have been increasingly framed as one and the same.

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In the Netherlands, intensive livestock farmers faced with a legal mandate to reduce nitrogen emissions were able to present their model as a sustainable one. The Farmer Citizens Movement (BoerBurgerBeweging, BBB), which emerged in the political conflict over nitrogen and the future of farming, played a decisive role in the Dutch provincial elections in March 2023. According to the BBB, “Highly productive agriculture such as that existing in the Netherlands saves space and land use worldwide.”

A land sparing narrative is also being employed in the debate over the use of herbicides and pesticides in agriculture. A position paper of the European branch of CropLife, a trade association of agrochemical companies, claims that organic farming should be supported as long as “resulting reduction in European agricultural productivity does not lead to unintended land use changes in other parts of the world, which could have detrimental effects on biodiversity and climate.”

At its core, the land sparing model sets a clear boundary between the human and the natural worlds. The key to salvation, its advocates believe, is to acknowledge this separation and apply it to land use and nature preservation. However, as much as we may try to think otherwise, we are organic beings whose long history has been one of ecological-social intertwining.

The separation of humans and nature is a historical product. When white settlers explored North America for the first time, they marvelled at the wilderness and abundant biodiversity they encountered. They were amazed at how they could ride their horses through the forests, which appeared to them divinely organised. Some thought it was paradise, others that it was an expression of backwardness. We now know that what settlers were seeing were highly complex managed landscapes, created through a harmonious dance of social practices and ecological forces.

Building new reciprocal relations to landscapes, where humans reconcile food production and biodiversity, represents a true alternative to environmental degradation. This idea is at the basis of agroecology with its political, social, and scientific practices of sustainability. Genuine ecologists should work in this direction instead of promoting a simplistic understanding of the food system.

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